READ THESE INSTRUCTIONS CAREFULLY BEFORE INSTALLING OR CONNECTING POWER TO THE ACTUATOR. THE ACTUATOR MUST BE INSTALLED, COMMISSIONED, OPERATED AND REPAIRED BY QUALIFIED PERSONNEL. COMPLY WITH ALL APPLICABLE CODES, STANDARDS AND SAFETY REGULATIONS.

STORAGE

Actuators should be stored in a clean, dry environment at all times. Do not install the actuator outdoors or in humid environments without immediately supplying power to activate the internal heater. The thermostatically controlled heater will help prevent possible damage caused by condensation build up inside the actuator.

INTRODUCTION

This document provides installation, operation and maintenance instructions for Valworx 5618 series electric actuators with MODBUS controller. These actuators are typically used to operate quarter-turn valves. Every actuator has been fully tested prior to shipment to ensure trouble free operation.

MOUNTING

The actuator can be mounted in any orientation. Allow enough room around actuator for manual operation as well as any maintenance. Valves can be direct mounted to the actuator using standard ISO5211 international mounting pad.

TEMPERATURE RATING

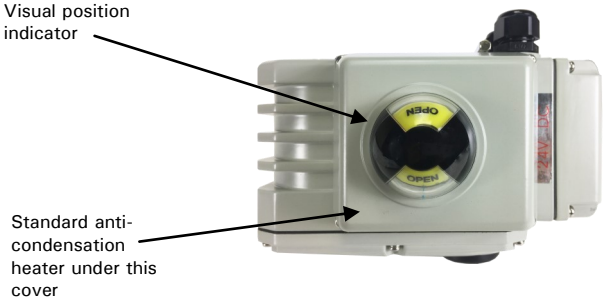
Operating temperature range of the actuator is –13 to +131°F (-25 to +55°C). Heat from the working medium (fluid) should not allow actuator to exceed these temperature limits. Optional high temperature valve mounting kits are available to increase the allowable media (fluid) working temperature.

ENCLOSURE RATING

The rugged aluminum housing is rated Type 4X and IP67 weatherproof. These actuators should not be used in explosion proof or hazardous applications.

VISUAL POSITION INDICATOR

Actuators are supplied with a local visual valve position indicator. This indicator is yellow and located on top of the actuator. Indicator will show the open and closed (on-off) position of the quarter-turn actuator (valve).



ANTI-CONDENSATION HEATER

The actuator has a standard integral thermostatically controlled 4 watt anti-condensation heater. Power should be maintained to activate internal heater. This heater will help prevent condensation build-up inside the actuator.

DUTY CYCLE AND MOTOR PROTECTION

The rugged 5618 series actuators are rated 70% duty cycle. Actuators are equipped with thermal overload protection with automatic reset to guard against over torque situations.

MECHANICAL TRAVEL STOPS

Rotation of the output drive is limited by adjustable mechanical stops. These stops are preset at the factory, no adjustment required.

MANUAL OVERRIDE

Valworx 5618 series electric actuators have a manual override for use during setup or loss of electrical power. To operate the manual override, first "REMOVE ALL ELECTRICAL POWER TO THE ACTUATOR" then open the manual override protective cover located on the side of the actuator. Insert a hex wrench (provided) and rotate to open (counter-clockwise) or close as required.

WARNING: Disconnect electrical power prior to operating manual override, removing covers or service.

MAINTENANCE

There are no internal parts that require regular maintenance. The gear drive is pre-lubricated for life. The housing may be cleaned with warm soapy water (no solvents). The actuator should be cycled at least once per month. DO NOT PRESSURE WASH.

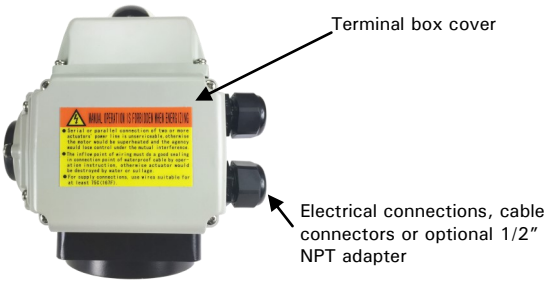
ELECTRICAL WIRING

Confirm the actuator VOLTAGE is correct, then remove the terminal box cover and connect wiring to terminal strip according to appropriate wiring diagram.

Wiring diagrams for each actuator are attached to the inside of the terminal box cover.

Input control and feedback is via a Modbus-RTU protocol using a 2-wire RS-485 serial communication interface. Actuator should have its own fused and isolated circuit. Do not connect actuators in parallel. Power to actuator should be maintained to activate the internal heater. This heater will help prevent condensation build-up inside the actuator.

Before connecting power, confirm correct VOLTAGE is being applied. Incorrect voltage may damage actuator and void the warranty.



OPERATION

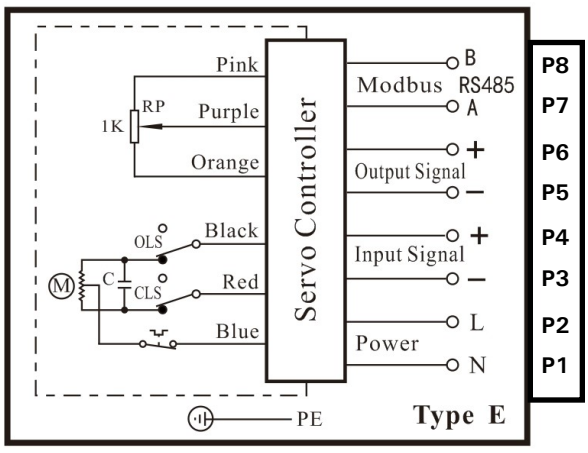
Valworx 5618 series electric actuator with Modbus control provides an accurate valve positioning function whereby the movement of the actuator is controlled by a Modbus-RTU command. The Modus module functions as an RTU slave responding to controller commands and uses only one address. Valve position is commanded via function code 0x10 (Write Multiple Registers). Valve status and error codes are accessed via function code 0x03 (Read Multiple Registers). See Table 1 for a list of register addresses and corresponding truth tables. Actuator may also be controlled with a 4-20mA signal.

Valve position is set on an integer scale of 0-10000. Upon loss of signal, actuator remains in or moves to commanded position. Upon loss of power, actuator remains in last position.

Analog mode is cancelled upon receipt of modbus position command.

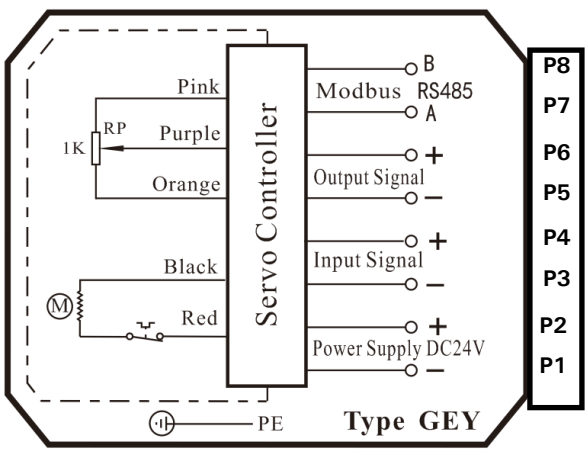
ELECTRICAL WIRING DIAGRAMS

AC Voltage Wiring Diagram



FOR SUPPLY CONNECTIONS, USE WIRES SUITABLE FOR AT LEAST 90°C (194°F) Employer Des Fils D'alimentation Qui Conviennent Pour Au Moins 90°C

DC Voltage Wiring Diagram



FOR SUPPLY CONNECTIONS, USE WIRES SUITABLE FOR AT LEAST 90°C (194°F) Employer Des Fils D'alimentation Qui Conviennent Pour Au Moins 90°C

AC Voltage Wiring:

1. AC power - Neutral
2. AC power - Line/Hot
3. Analog Input control signal - Negative (-)
4. Analog Input control signal - Positive (+)
5. Analog Output monitoring signal - Negative (-)
6. Analog Output monitoring signal - Positive (+)
7. RS485 A Modbus (+)
8. RS485 B Modbus (-)

DC Voltage Wiring:

1. DC power - Negative (-)
2. DC power - Positive (+)
3. Analog Input control signal - Negative (-)
4. Analog Input control signal - Positive (+)
5. Analog Output monitoring signal - Negative (-)
6. Analog Output monitoring signal - Positive (+)
7. RS485 A Modbus (+)
8. RS485 B Modbus (-)

NOTES: 1. Actuator should have its own fused and isolated circuit. 2. Do not wire actuators in parallel. 3. Output signal is 4-20mA. Use of the output signal is optional.

Internal Diagram

1. Terminal strip
2. Selection switches (S-A, S-B)

L1. Power light (power on - green)

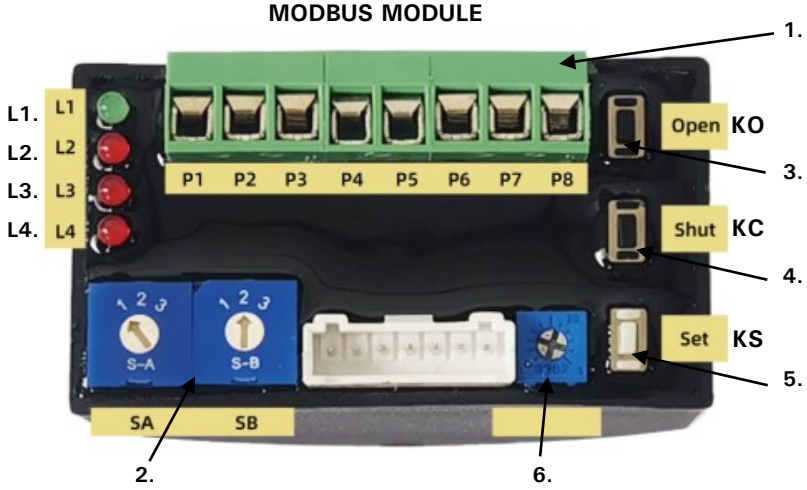
L2. Control Signal status light (red)

L3. Potentiometer status light (red)

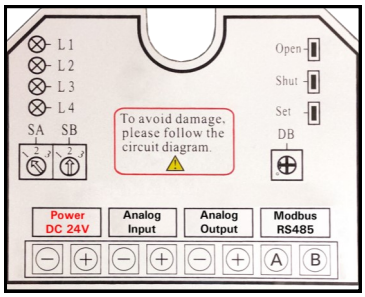
L4. Over torque status light (red)

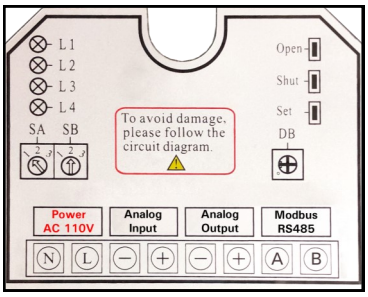
3. Manual Open control button- **KO**
4. Manual Close control button- **KC**
5. Set button (white)- **KS**
6. Deadband Adjustment (factory preset) - set actuator to manual mode before altering - see chart below.

MODBUS MODULE



24 VDC MODELS	110 VAC MODELS
Control Module	Control Module





OPEN/SHUT POSITION CALIBRATION- **ANALOG ONLY**

ALL ACTUATORS ARE CALIBRATED AND TESTED AT THE FACTORY. NO ADJUSTMENTS REQUIRED FOR MOST APPLICATIONS If recalibration is required, follow these steps: Supply correct power to the actuator. Set switches to manual mode as shown below. Manually operate actuator using chart below. Once new desired "Open" or "Closed" position is reached, hold down both the matching manual control button for the position you wish to set **AND** the White "SET" button simultaneously until the L2 red light comes on - then release both buttons. The position will now be set when you switch S-A back to original position.

Control Mode Selection Switch Setup			S-A	S-B
4-20mA Input (default setting)* *To change setup from default setting, power must first be applied to actuator, control signal OFF	**Standard Auto Mode A (default setting)**	Actuator closed with 4mA signal, open with 20mA signal. Stops with loss of control signal	1	2
	Standard Auto Mode B	Actuator closed with 4mA signal, open with 20mA signal. Moves to closed position with loss of control signal	1	3
	Standard Auto Mode C	Actuator closed with 4mA signal, open with 20mA signal. Moves to open position with loss of control signal	1	1
	Reverse Acting Mode A	Actuator open with 4mA signal, closed with 20mA signal. Stops with loss of control signal	3	2
	Reverse Acting Mode B	Actuator open with 4mA signal, closed with 20mA signal. Moves to closed position with loss of control signal	3	3
	Reverse Acting Mode C	Actuator open with 4mA signal, closed with 20mA signal. Moves to open position with loss of control signal	3	1
Manual operation of actuator using control button operation	**Manual Mode - Open or Closed**	Manually move the actuator to open position using OPEN control button. Manually move the actuator to closed position using CLOSED control button. Do not hold OPEN & CLOSED down simultaneously.	2	2

SET COMMUNICATION PARAMETERS

Registers 0x0040 – 0x0042 are used to configure communication parameters. See Table 1 for values.

1. Enter Configuration Mode: Write 0xA501 to register 0x0040.
2. Set Communication Address (0x0041) and baud rate (if desired) (0x0042)
3. Parameters will be updated in ~ 1 second. Subsequent communication must be in accordance with the new parameters.
4. Exit Configuration Mode: Write 0xA500 to register 0x0040

ID	Name	Description
0x03	Read multiple registers	In a remote device, use this function code to read the contents of the continuous blocks in holding registers
0x10	Write multiple registers	In a remote device, use this function code to write consecutive registers blocks (1 to around 120 registers)

RESTORE DEFAULT COMMUNICATION PARAMETERS

The communication parameters may be reset to their default values via the following procedure:

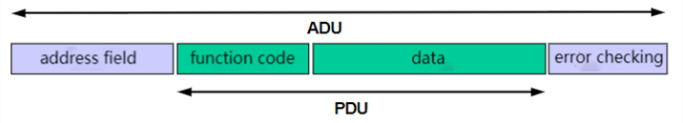
1. Set SA and SB in position 2
2. Press and hold the KS button until the red light begins blinking, about 3 seconds.
3. Release the KS button.
4. Press the KC button until the red light is steady on, about 3 seconds.
5. Release the KC button.
6. Set SA back to position 1.

Communication parameters are now reset to the default values. Subsequent communication must be in accordance with the reset parameters.

NOTE: TO AVOID ADDRESS CONFLICT THE COMMUNICATION ADDRESS SHOULD IMMEDIATELY BE CHANGED FROM THE DEFAULT VALUE OF 1

APPLICATION LAYER

Application Data Unit (ADU)



SUPPORTED FUNCTION CODES

0x03 Read Multiple Registers

0x10 Write Multiple Registers

Other function codes are not supported.

HARDWARE LAYER

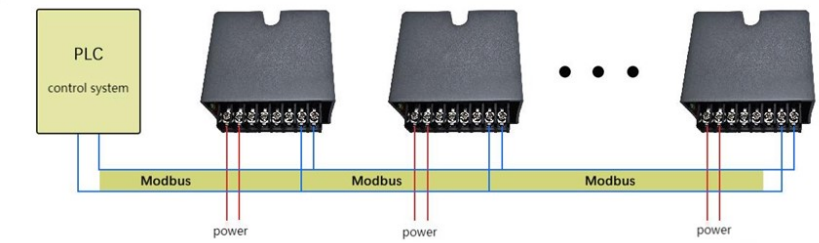
Protocol: Modbus-RTU
Interface: RS485 2-wire
Communication Address: 1- 127, default = 1
Communication Baud Rate: Configurable, default = 9600
Serial Port Format: 1 start bit + 8 data bits + 1 stop bit
Broadcast Message (Address 0x00): Supported (write only)

The interfaces are defined as follows:

Top View

P1：power -
P2：power +
P3～P6： analog reserved signal（4～20mA）
P7：Modbus +
P8：Modbus -

Modbus wiring diagram:



*Note: valve position is still recorded in register 0X0019 even if controlled with an analog signal.

TABLE 1

Address	Bit	Group	Signal Name	Min	Max	Unit	r/w	Type	Truth Table	Description
	b15-b5	\	\	\	\	\	r/w	hex	reserve 0	Reserve
	b5	\	\	\	\	\	r/w	hex	reserve 0	Reserve
	b4	control	stop	\	\	\	r/w	hex	1:stop, 0:normal	Stop running
0x0010	b3	\	\	\	\	\	r	hex	reserve 0	Reserve
	b2	\	\	\	\	\	r	hex	reserve 0	Reserve
	b1-b0	control	mode	\	\	\	r/w	hex	1: communication control other: exit communication control	Control mode
0x0011	b15-b0	control	SetOpenDegree	0	10000	%	r/w	int hex	0-10000 corresponds to 0-100%open degree	Control valve open degree (ratio coefficient 1/100)
0x0012	b15-b0	\	\	\	\	\	r	hex	reserve 0	Reserve
0x0013	b15-b0	\	\	\	\	\	r	hex	reserve 0	Reserve
0x0014	b15-b0	\	\	\	\	\	r	hex	reserve 0	Reserve
0x0015	b15-b0	\	\	\	\	\	r	hex	reserve 0	Reserve
0x0016	b15-b0	\	\	\	\	\	r	hex	reserve 0	Reserve
0x0017	b15-b0	\	\	\	\	\	r	hex	reserve 0	Reserve
	b15-b6	\	\	\	\	\	r	hex	reserve 0	Reserve
	b5	infor	errPosition	\	\	\	r	hex	1: position signal error	Error: Position signal flag
	b4	infor	errSignal	\	\	\	r	hex	1: input signal error	Error: input signal flag
0x0018	b3	infor	overTorqueFlag	\	\	\	r	hex	1: over torque	Over torque flag
	b2	infor	stuckFlag	\	\	\	r	hex	1: stuck	Stuck flag
	b1	infor	openRunFlag	\	\	\	r	hex	1: valve close in progress	Open valve flag
	b0	infor	closeRunFlag	\	\	\	r	hex	1: valve open in progress	Close valve flag
0x0019	b15-b0	infor	openDegree	0	10000	%	r	int hex	0-10000 corresponds to 0-100% open degree	Current valve open degree (ratio coefficient 1/100)
0x001A	b15-b0	\	\	\	\	\	r	hex	reserve 0	Reserve
0x001B	b15-b0	\	\	\	\	\	r	hex	reserve 0	Reserve
0x001C	b15-b0	\	\	\	\	\	r	hex	reserve 0	Reserve
0x001D	b15-b0	\	\	\	\	\	r	hex	reserve 0	Reserve
0x001E	b15-b0	\	\	\	\	\	r	hex	reserve 0	Reserve
0x001F	b15-b0	\	\	\	\	\	r	hex	reserve 0	Reserve
0x0040	b15-b0	config	cfgMode	1	127	\	rw	hex	0x0000: enter normal mode 0xA501: enter config mode	Mode select，the configuration parameters can be modified only in configuration mode
0x0041	b15-b0	config	cmm_addr	1	127	\	rw	hex	1～127	Set communication address
0x0042	b15-b0	config	cmm_baudrate	\	\	\	rw	hex	0: baudrate 4800 1: baudrate 9600 2: baudrate 19200 3: baudrate 115200	Set baudrate The baudrate is written according to the truth table. The baudrate is returned according to the actual value
0x0043	b15-b0	\	\	\	\	\	r	hex	reserve 0	Reserve
0x0044	b15-b0	\	\	\	\	\	r	hex	reserve 0	Reserve
0x0045	b15-b0	\	\	\	\	\	r	hex	reserve 0	Reserve
0x0046	b15-b0	\	\	\	\	\	r	hex	reserve 0	Reserve
0x0047	b15-b0	\	\	\	\	\	r	hex	reserve 0	Reserve
0x0048	b15-b0	\	\	\	\	\	r	hex	reserve 0	Reserve

COMMUNICATION INSTRUCTION EXAMPLES

Control valve position

Enter communication control mode：
transmit→◇01 10 00 10 00 01 02 00 01 65 00
receive←◆01 10 00 10 00 01 00 0C
Set valve position: 0%
transmit→◇01 10 00 11 00 01 02 00 00 A5 11
receive←◆01 10 00 11 00 01 51 CC
Set valve position: 50% (5000 -> 0x1388)
transmit→◇01 10 00 11 00 01 02 13 88 A8 47
receive←◆01 10 00 11 00 01 51 CC
Set valve position: 100% (10000 -> 0x2710)
transmit→◇01 10 00 11 00 01 02 27 10 BF 2D
receive←◆01 10 00 11 00 01 51 CC
stop running
transmit→◇01 10 00 10 00 01 02 00 11 64 CC
receive←◆01 10 00 10 00 01 00 0C

Read valve status

transmit→◇01 03 00 18 00 02 44 0C
receive←◆01 03 04 00 30 00 00 FA 3C

Set communication address:

Enter configuration mode
transmit→◇01 10 00 40 00 01 02 A5 01 12 00
receive←◆01 10 00 40 00 01 00 1D
Change communication address to：2
transmit→◇01 10 00 41 00 01 02 00 02 28 80
receive←◆01 10 00 41 00 01 51 DD
Exit configuration mode
transmit→◇02 10 00 40 00 01 02 A5 00 C7 30
receive←◆02 10 00 40 00 01 00 2E

Set communication baudrate

Enter configuration mode
transmit→◇01 10 00 40 00 01 02 A5 01 12 00
receive←◆01 10 00 40 00 01 00 1D
Change communication baudrate to：9600
transmit→◇01 10 00 42 00 01 02 00 01 68 B2
receive←◆01 10 00 42 00 01 A1 DD
Exit configuration mode
transmit→◇01 10 00 40 00 01 02 A5 00 D3 C0
receive←◆01 10 00 40 00 01 00 1D